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ABSTRACT

This article discusses how developmental and behaviorist learning theories can be used to create educational games. The Piagetian rationale for the use of games is examined and three benefits of gaming are identified: (1) games are related to intellectual, socio-emotional, and motor learning in young children, (2) gaming requires aspects of assimilation and accommodation, and (3) a child's responses to gaming reflect the mental level at which that child is operating. The behavorist rationale for using games with young children is then examined and two beneficial aspects are identified: (1) games motivate the establishment of cause-effect relationships that can be used in the process of problem solving and (2) games foster the acquisition of specific knowledge about the color, shape, and texture of objects in the environment. The conception of an adequate gaming strategy from a motivational theorist's point of view is then presented. According to this conception, a game's major objective should be to stimulate children to continue to engage in problem solving behavior that grows out of the questions posed during the game. Sample Piagetian and behavorist games are included. (JMB)

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GAMING IN EARLY CHILDHOOD EDUCATION

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Gaming in Early Childhood Education

Games as instructional aids in classrooms have long been used in early childhood programs, preschool through third grade. With the advent of Head Start in 1965, the importance of the early years to the development of the young child, and the use of games to facilitate growth and learning were rediscovered. With researchers such as Piaget from developmental psychology and Skinner, Risely, O'Learey, Ellis and others from clinical psychology, gaming with young children took on more importance as they further explored the formative years of the young child. Although early educators intuitively felt that gaming with youngsters was important for growth and learning, the results of current researchers like Piaget, Ellis and Skinner and their associates, demonstrated that games can make an important contribution to the intellectual, as well as socio-emotional and motor development of young children. The focus of this article is to show how the theories developed by these researchers can be used to create games which can be used to explore and enhance the growth and development of the young child. To this end, examples of games and supporting rationales are provided.

Rationale - Developmental & Behaviorist Perspectives

There are a number of theoretical perspectives from which to view gaming and its benefits to young children. Two of these are the developmental and behavioral orientations. Believing that the intellect evolves through a series of ordered stages from sensor-motor to abstract or formal thought, Piaget (1962), a developmentalist, and his followers established the importance of the gaming process to the development of the young child. The Piagetian rationale for the use of games with young children is quite specific and is based on three main factors related to Piaget's view of "how human beings learn."

First, games are related to the growth of intellect, socio-emotional, and motor learning in young children. These outcomes derived from opportunities to play games are both process and product related. This means, as children play games and use their senses of seeing, hearing, touching, moving, and smelling they learn about themselves and the world around them. This process learning is the outcome of involvement. Examples of possible product outcomes steming from a manipulative type game include one to one correspondence, matching and ordering objects by size and shape, or recognizing properties of objects. Learning to use small and large muscles and coordinate body movements related this type of game are additional product outcomes. Example process outcomes are inquiry related and include classifying objects used within the game by color or shape and learning to predict outcomes given certain "moves" made by the players.

Secondly, gaming requires aspects of assimilation and accommodation--the primary and basic ingredients of all past, present and future growth and learning. In a gaming context, assimilation means the child's ability to take in information from the play object and mentally and physically process it. Assimilating information qualitatively changes it given the child's current level of mental growth. Accommodation occurs when the child tries out the information to see how it fits with solving the problems posed by the game. Through this accommodation process, the child actively uses the information assimilated in the real world for specific purposes.

The significance of gaming can be seen in a third factor which is related to "how human beings learn." Since thinking evolves in stages and the stages are ordered from simple to complex, a child's responses to gaming reflects the mental level at which that child is currently operating. For example, in the stage of pre-operational thought, children operate irrationally and

this type of thinking shows very little relationship to their actions. In other words, what children do physically during a game may not be related to the justification they give for their actions: they are egocentric. At the concrete stage of thought, children do provide justifications for their actions in concrete but not abstract terms. Here, the child's thinking is tied to physical objects manipulated in the game. The children's level of thinking is very much tied to physical action of objects used to show even elementary concepts. During the formal operations stage of thought, children can use logical thought and reason in the abstract. Mental actions do not require physical manipulation of objects used in a game in order to derive concepts needed to successfully play a game. The child at this stage can abstractly process the consequence of a series of moves and mentally arrive at a logical solution.

Believing that the intellect evolves through reinforcement in stimulus-response hierarchies, Ellis, a motified behaviorist and motivational theorist, established the importance of gaming to the young child's cognitive growth. Ellis (1973) points out that gaming tics into behavioral-motivational theory in that it provides a setting rich in arousal and stimulus seeking potential. Consequently gaming can be used to motivate children to explore their environment through the introduction of objects and/or symbols that are sufficiently novel and interesting to provoke children's curiosity. This exploration, White (1959) points out, involves children in discovering the effects they can have on the environment as well as the effects the environment can have on them. As a result children in playing games develop an increasing ability or competence to understand their environment in terms of cause-effect relationships. In short, children are motivated by gaming to develop their competence to use cause-effect relationships to solve problems

presented by their environment. In general, the behaviorist rationale for using games with young children is that it motivates the establishment of cause-effect relationships that can be used in the process outcome of problem solving. Product outcomes, or specific knowledge about the color, shape, and texture of the objects, and also achieved.

From Ellis' point of view, what is an adequate gaming strategy? First, an adequate game orients the children's primary senses by supporting their efforts to gather information about the game through the visual and auditory senses. Second, it should stimulate them to further investigate its properties through direct manipulation of objects. Here, the tactile and kinesthetic sense are used to further explore the game's specific characteristics. Third, appropriate rewards should be used to reinforce their attempts to manipulate the objects and related symbols as they answer questions posed while playing the game. To maintain interest the game should be sufficiently complex so that the children's previous experiences are not adequate to allow them to answer all of the questions posed during the game. Thus, a game's major objective should be to stimulate children to continue to engage in problem solving behavior that grows out of the questions posed during the game.

From a behavioral focus an adequate gaming strategy should first orient the children's primary senses by supporting the child's efforts to gather information about the game through visual and auditory senses. Second it should stimulate them to further investigate its properties, through actual manipulation of objects. Here, the tactile and kinesthetic senses are used to further explore the game's specific characteristics. Appropriate rewards should be used to reinforce their attempts to manipulate the objects and related symbols as they answer specific questions posed while playing the game. Finally, a game's format should stimulate children to continue to engage

in similar problem solving behavior that grows out of the questions posed during the game.

Sample Games

The games that follow were developed using the check list (criterion) developed by Trueblood and Szabo (1974). Each item in the check list corresponds to the underlined side heading in the sample games below.

A Piagetian Game

Gaming from a developmental perspective involves exploration, observation, challenges through questioning, justifications given for the responses to the challenges, extending conceptual abilities and advancing. Each of the components of the procedure involved in the gaming process helps facilitate the intellectual development of the young child. Basic to gaming is the child's ability to solve logical problems presented. This same ability is fundamental to Piaget's position on "how human organisms learn."

Objective:

Given a set of 18 shapes (six triangles, six circles, six rectangles, all of same size with one set of each of three one primary color and one set of each of three one secondary color), the child matches shapes by size to response board and/or by color according to intellectual abilities.

Materials:

(1) Response board.

(2) Eighteen triangles, 6 circles, 6 rectangles, 6 triangles, all the same size but vary in color. Both primary and secondary colors are used.

(3) Observational/anecdotal recording form as evaluation.

(4) Chairs/table for playing or hard floor surface.

Procedure:

Allow time for the children to explore and manipulate the shapes and response board. The time for exploring gives the children the opportunity of interacting with the object--physically and mentally--in a free unrestrained way. Observing provides the opportunity to see the types of actions the youngster uses in the shapes and response board. After the exploratory period, children are challenged by questioning to think about ways of solving the problem posed. Examples include, "Do you see any of the shapes that are alike?", "How are the shapes in the pile different from each other?", and, "Are there any shapes on the response board that look like the shapes in the pile?" Through challenges the child becomes involved, begins to think about solutions and in turn mentally views the game from other perspectives. After challenging and at an appropriate time, the process of matching the shapes to the response board is introduced. Again the matching procedure is introduced and carried through in questioning format. As the youngster responds he or she is asked to prove or verify the answer. Examples of this type of challenge together with the justification include:

(1) "Are there any shapes in the pile that look like the shapes on the response board?"--"Show me!" "How do you think they look alike?"

(2) "What other ways do the shapes in the pile and on the response board look alike?"--"Show me!" "How do you think they look alike?"

The types of questions will vary from child to child and depends exclusively upon the explanations given to the challenges.

Variations:

After appropriate questions like the above are asked, the focus of the challenge is changed. With change in focus of the challenge, many variations

of the game are possible. For instance, the students can be querried on how the shapes in the pile differ from the ones on the response board. Asking how the shapes differ is a variation of recognizing similarities. This variation also has the potential of extending children's thought processes.

Overview:

Given the objective and developmental perspectives, the gaming actions are operationalized as follows:

Evaluation:

Note the children's physical and verbal responses to the questions. Of particular importance are the questions which require the child to justify his or her own statements and answers in light of the initial challenge. This process extends the child's thought. Examine the student's justifications

to see whether or not they appear to be straightforward and logical explanations of the problem. If the rationale offered by the children do not appear to be logical, continue the questioning procedure and advance their thinking by having them realize why their responses are not logical and appropriate to the problem.

Recording Diagnostic Information:

The information received can be recorded by the educator using the following form.

Piagetian Record Form

NAME:_____ DATE OF OBSERVATION:_____

GAME:_____ SETTING:_____

Adult	Child
(1) Challenging by Questioning:	(1) Child responding and justifying
1.	1.
2.	2.
3.	3.
(2)	(2) Advancing
1.	1.
2.	2.
3.	3.

(Above process repeated with new adult challenge.)

(3) Additional Related Comments:

A Behaviorist Game

Gaming from a behaviorist perspective involves the use of the games to motivate students to manipulate objects used in the game for a particular purpose, i.e. personal problem solving. This activity helps in turn to facilitate the young child's intellectual growth thus enabling him or her to develop "learning how to learn skills" that will transfer solving problems encountered within the environment.

Objective:

Given a set of 18 shapes composed of circles, triangles, and rectangles of the same size and color, the child will select a shape and place it correctly on the response board with 90% accuracy.

Materials:

(1) Response board.

(2) Eight circles, eight triangles, eight rectangles that are the same in size and color.

(3) Student record cards like the one below.

(4) Chairs and a table that can be used as a playing surface.

Procedure:

The directions to the game can be given orally. Check to see that they are understood by all players before the game begins. To determine who plays first, begin by rolling a die. The highest roll goes first by selecting a shape from the pile on the table and placing it on a form on the response board. If the student makes a correct match, give him/her a chip that can be traded in after the game for a prize if appropriate. If the student makes an incorrect match, he/she places the shape back in the pile on the table. Record each student's response on his/her record card. Play then moves to the first player's right. The game ends when time is called!

Variation:

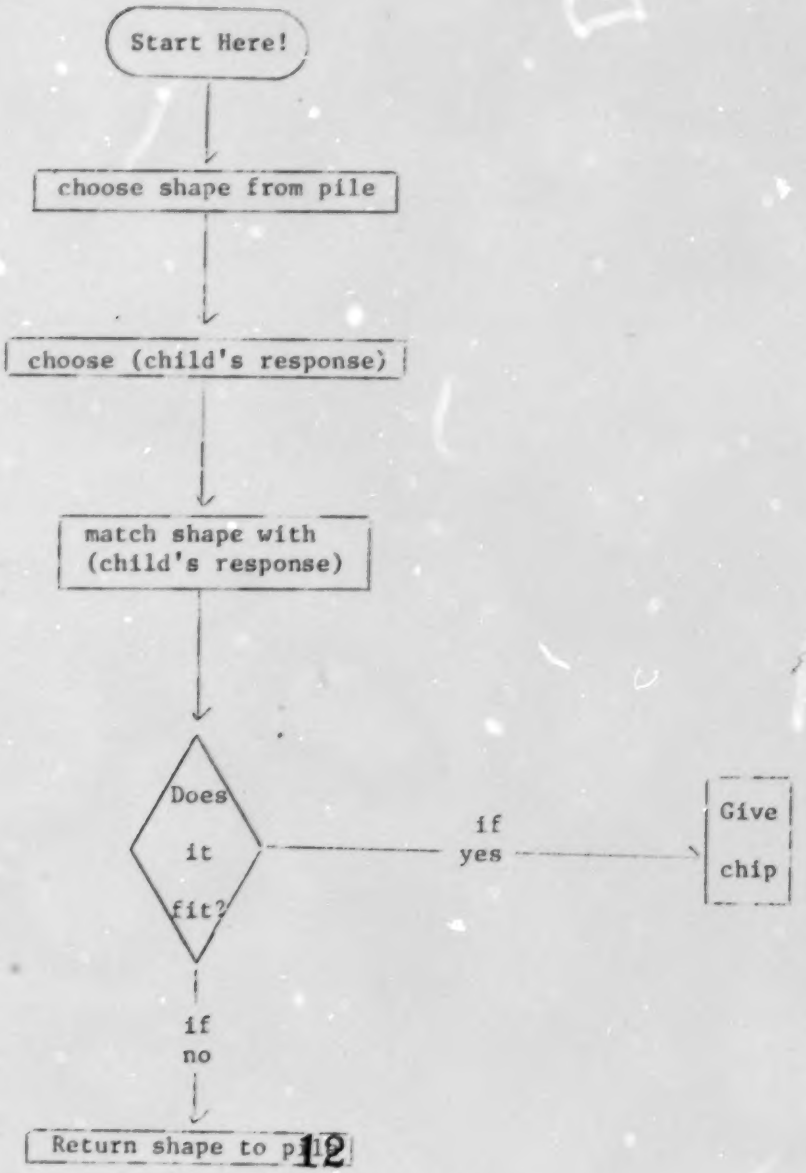
(1) Increase or decrease the type of shapes from 3 to 4 based upon the student's success.

(2) Increase the number of variables the students must use to correctly classify (match) the shapes e.g. color and shape instead of just shape.

Overview:

SCHEMATIC OF GAMING ACTIONS

Given the objective and behavioral perspectives, the gaming actions are operationalized as follows:



Evaluation:

Check each students response card. Count the number of incorrect and correct responses and check to see which shapes are incorrect and correctly matched most often. Prepare the next game to give the students more practice with the most missed shapes. This should be done by . . . .
Also ask the students how they felt about playing the game . . . .

Record Diagnostic Information:

Record the child's choice of his or her response on the form below.

Behavioral Record Form

NAME:_____ DATE OF OBSERVATION:_____

NUMBER CORRECT:_____ NUMBER INCORRECT:_____

Choice	Response
○	△

Concluding Remarks:

Gaming in early childhood is an essential activity that can be viewed from both the developmental and behavioral perspectives. From the developmental perspective, gaming provides children with the flexibility to operate on their environment as they solve problems posed by the game. The young child with some adult guidance plays the game and learns to explain and justify verbal and physical moves that will transfer to the mastery of his/her world. The questions raised by both child and caregiver provide a natural forum for practicing the decision making processes involved in both playing games and real world problem solving.

From the behaviorist perspective, gaming motivates children to explore their environment by introducing objects and symbols that are novel and intrinsically interesting. During this exploration children are guided by the game's structure and reward system to discover the cause-effect relationships that over time develop their capacity to solve problems. It would seem that regardless of one's perspective, the crucial outcomes that can be achieved by using games with young children are those related to problem solving. The authors hope the sample games they have provided will interest the reader in creating some of their own games. Children's willingness and natural inclination to play games, the fun and enjoyment created and the learning outcomes to be gained make gaming a significant endeavor for early education and developmental program for young children.

Regardless of perspectives, the procedures outlined for gaming can be easily applied to individual children or children in group settings. The willingness and motivation to play, the fun and enjoyment created and the learning outcomes gained make gaming a significant endeavor for all early education and development programs for young children.

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